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(54) Hand-held vacuum cleaner with a detachable head

(57) A hand-held vacuum cleaner includes a housing (10), a suction fan (112) and a first motor (110) assembly located in the housing and a dirt container (18) detachably mounted on the housing. A suction nozzle (16) is selectively mounted on the housing and is usable both in an attached position and in a detached position for cleaning. A brushroll (50) and a second motor (70) are mounted within the suction nozzle. An electrified hose (20) is connected to the housing and to the suction nozzle (16). The dirt container (18) includes an inlet in fluid communication with the electrified hose (20), and an outlet in fluid communication with the suction fan (112) and first motor (110) assembly. A filter assembly is releasably positioned for form an outlet of the dirt container. The dirt container (18) has a latching mechanism for securing the dirt container to the housing. The housing (10) further includes a hollow section formed above the suction fan (112) and first motor (110) assembly for storing a cleaning attachment.

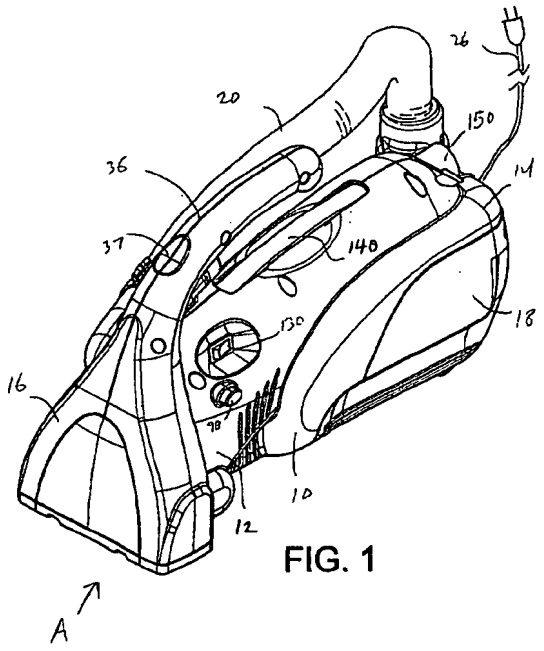

FIG. 1

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Description

Background of the Invention

[0001] The present invention relates to a portable hand-held vacuum cleaner. More particularly, the present invention relates to a hand-held vacuum cleaner with a powered rotary brush within a detachable head for suctioning dirt and debris from carpets, floors, and above-floor surfaces.

[0002] Portable hand-held vacuum cleaners have become extremely popular for cleaning a variety of surfaces in homes, offices, cars or the like. They are utilized typically for small clean-up jobs or for cleaning in hard-to-reach places. These portable vacuum cleaner units are relatively light weight and have a handle in order to enable a user to readily utilize them in places where canister, upright or shop-type vacuum cleaners cannot be used or are inconvenient to use.

[0003] While such prior art portable hand-held vacuum cleaners have worked well for their intended purposes, they have been primarily useful for picking up light weight dry debris, such as dust and small particulate matter. Where heavier and more dense particulate matter is encountered, they have been less effective. In fact, even where dust or other lighter particulate matter are desired to be picked up or collected, the overall efficiency and effectiveness of the prior vacuum cleaners has been less than desired.

[0004] Another limiting factor of some prior art portable vacuums is the efficiency and effectiveness of the airflow path through the vacuum cleaner units, while depositing debris in a debris canister or container.

[0005] Some prior art hand-held vacuum cleaner units do not include brushes which would help loosen dirt or debris from the surface being cleaned prior to vacuuming. Furthermore, the prior art hand-held vacuums do not have a detachable head for vacuuming in hard-to-reach places or tight places where even a hand-held vacuum cleaner cannot fit.

[0006] Other hand-held vacuums are difficult to use in that they are awkward to service. Others are expensive to produce in that they have complex reciprocating brush mechanisms.

[0007] Accordingly, it is desirable to develop a new and improved hand-held vacuum cleaner which would overcome the foregoing deficiencies and others while meeting the above-stated needs and providing better and more advantageous overall results.

Summary of the Invention

[0008] The present invention relates to a new and improved hand-held vacuum cleaner. More specifically, the hand-held vacuum cleaner has a detachable head or suction nozzle which houses a powered brushroll for loosening dirt and debris from a surface to be cleaned.

[0009] According to one aspect of the invention, the hand-held vacuum cleaner comprises a housing having a first end and a second end. A suction fan and a first motor assembly are housed within the housing. A dirt container is detachably mounted on the housing second end, and a suction nozzle is selectively mounted at the housing first end. The suction nozzle is usable both in an attached position and in a detached position for cleaning.

[0010] The suction nozzle has a handle. At least one air outlet is provided in a wall of the housing for allowing air to exhaust from the housing and for venting and cooling the motor. The housing further comprises a hollow section formed above the suction fan and first motor assembly for storing a cleaning attachment. A handle is secured to a top surface of the housing.

[0011] A brushroll and a second motor are housed within the suction nozzle. An electrified hose is connected at a first end to the suction nozzle and at a second end to the housing second end. The second motor is operatively connected to the electrified hose first end and to the brushroll.

[0012] The dirt container defines a dirt and dust collecting chamber. The dirt container comprises an inlet in fluid communication with the electrified hose, and an outlet in fluid communication with the suction fan and first motor assembly. A filter assembly is releasably positioned to form a wall and outlet of the dirt container. The filter assembly comprises a filter and a filter frame. The dirt container further comprises a latching mechanism for securing the dirt container to the housing second end.

[0013] One aspect of the present invention is the provision of a new and improved hand-held vacuum cleaner.

[0014] Another aspect of the present invention is the provision of a hand-held vacuum cleaner that includes a detachable suction nozzle.

[0015] According to still another aspect of the present invention, a hand-held vacuum cleaner has a detachable suction nozzle or 'head" which houses a rotatable brushroll and a motor for powering the brushroll.

[0016] Yet another aspect of the present invention is the provision of a hand-held vacuum cleaner including an electrified hose for providing power to a motor located within a detachable suction nozzle.

[0017] Yet still another aspect of the present invention is the provision of the suction nozzle that is detachable from a housing of a vacuum cleaner and is usable in an attached or in a detached position.

[0018] Still other benefits and advantages of the invention will become apparent to those skilled in the art upon reading and understanding the following detailed description.

Brief Description of the Drawings

[0019] The invention may take form in certain components and structures, one embodiment of which will be

illustrated in the accompanying drawings wherein:

FIGURE 1 is a perspective view of the hand-held vacuum cleaner according to one embodiment of the present invention;
FIGURE 2 is a perspective view of the vacuum cleaner of **FIGURE 1** with a detachable head separated from a housing;
FIGURE 3 is a perspective view of the detachable head and a dirt container separated from the housing;
FIGURE 4 is an exploded perspective view of the hand-held vacuum cleaner of **FIGURE 1;**
FIGURE 5 is an enlarged, exploded perspective view of the detachable head and a brushroll assembly of the hand-held vacuum cleaner of **FIGURE 1;**
FIGURE 6 is an enlarged, exploded perspective view of the housing of the hand-held vacuum cleaner of **FIGURE 1;**
FIGURE 7 is an enlarged, exploded perspective view of the dirt container of the hand-held vacuum cleaner of **FIGURE 1;**
FIGURE 8 is an enlarged, exploded perspective view of the dirt container of **FIGURE 7** in an assembled form and a filter and filter frame thereof;
FIGURE 9A is a side elevational view of the detachable head of the vacuum cleaner of **FIGURE 1;**
FIGURE 9B is a rear elevational view of the detachable head of **FIGURE 9A;**
FIGURE 10A is a side elevational view of the housing of the vacuum cleaner of **FIGURE 1;** and
FIGURE 10B is a front elevational view of the housing of **FIGURE 10A.**

Detailed Description of the Embodiment

[0020] Referring now to the drawings, wherein the showings are for purposes of illustrating an embodiment of this invention, **FIG. 1** shows a hand-held vacuum cleaner **A** according to one embodiment of the present invention.

[0021] The hand-held vacuum cleaner **A** includes a housing **10** having a first end **12** and a second end **14.** A suction nozzle or head **16** is selectively mounted at the housing first end **12** and is usable in both an attached position (shown in **FIG. 1**) and in a detached position (shown in **FIG. 2**) for cleaning. A dirt cup or container **18** is detachably mounted on the second end **14** of the housing.

[0022] A conventional flexible, elongated electrified hose **20** connects at a first end **22** to the suction nozzle **16** and at a second end **24** to the housing second end **14** and then to the dirt container **18.** The hose **20** is electrically conductive to provide power to a motor housed within the suction nozzle.

[0023] The hose **20** has at its ends **22** and **24** conductors which are connected to any suitable transformer relay mounted within the housing **10** and suction nozzle **16,** respectively, and electrically connected to a first motor **110** within the housing **10** and to a second motor **70** within the suction nozzle **16,** respectively. It is well known in the prior art to use an electrically conductive hose for powering a motor in a vacuum cleaner. A power cord **26** is connected to the housing **10** to power the hand-held vacuum cleaner.

[0024] Referring to **FIG. 3**, the hand-held vacuum cleaner has three main components: the detachable head or suction nozzle **16,** the housing **10,** and the detachable dirt container **18. FIG. 4** illustrates the internal parts of each of these components.

[0025] Referring now to **FIG. 5,** the suction nozzle **16** is comprised of a first housing portion **30** and a second housing portion **32** which are fastened together by suitable fasteners (not shown). A nozzle portion **34** is attached between the first housing portion **30** and the second housing portion **32.** The first and second housing portions **30** and **32,** when assembled, form a handle **36.** The handle **36** may have a curved shape as shown in **FIG. 1.** An indentation **37** can be added onto a top surface of the handle **36** to allow the user to place a thumb or other finger in the indentation to aid in gripping the handle.

[0026] A bottom plate **38** is mounted below nozzle portion **34** and defines an opening **40.** The opening **40** serves as a suction opening through which dirt, dust and other debris is suctioned into the nozzle **16.** A back plate **42** is mounted onto the housing portions **30** and **32** to define the interior of the suction nozzle. If desired, the suction nozzle **16** can be fabricated from a thermoplastic material.

[0027] A conventional brushroll **50** is rotatably mounted within the suction nozzle **16.** Bristles **52** extend along the circumference of brushroll **50.** Bearings **54, 56** are mounted on opposite ends of the brushroll **50** and are mounted onto inside surfaces of the nozzle **16** to aid in rotation of the brushroll **50.** A belt **58** is looped around the brushroll **50** and also around a cogged pulley **60** mounted on an output shaft of a motor **70** also housed within the suction nozzle **16.** The belt **58** is toothed to engage the cogged pulley **60** and also an appropriately cogged peripheral portion **61** of the brushroll.

[0028] The electrified hose **20** is attached to the suction nozzle through a sleeve **80.** The sleeve **80** protects the electrical connectors of the hose. The hose **20** is secured into place by rotating a locking cuff **81** on the hose to a locked position. The hose **20** is connected by a connector **82** to motor **70** for powering the motor.

[0029] With reference now to **FIGURES 2, 9A, 9B, 10A** and **10B,** a plate **90** is mounted on the back plate **42** of the suction nozzle **16** for slidably engaging a slot **91** in the housing **10.** A raised, curved portion **92** of the nozzle also engages a second slot **93** in the housing **10.** Raised portion **92** also houses the motor **70** of suction nozzle. The nozzle is secured to the housing through the engagement of the plate **90** and raised portion **92** with slots **91, 93.** The slot **91** is tapered from an inlet

side **94** of the housing **10** to ensure that the head **16** cannot slide through the slot. Wall **95** also serves to block or stop head **16** from sliding completely through the slot **91.** A tab **96** extends into slot **91** and engages a notch **97** in plate **90** and locks the head **16** in place. As the plate **90** enters slot **91**, plate **90** pushes on a spring bias on tab **96** thus retracting the tab **96** into the housing. When notch **97** aligns with the tab **96**, tab **96** then releases into engagement with the area of notch **97.** A conventional linkage connects the tab **96** to a locking button **98.** A tab **99** on raised portion **92** also engages a groove **101** in slot **93.** When the nozzle is to be removed from the housing, button **98** is depressed to retract tab **96** and allow head **16** to be pulled out of slots **91, 93** and be removed from the housing **10.**

[0030] Referring now to **FIG. 6**, the housing **10** will now be described. The housing **10** comprises a first housing half **100** and a second housing half **102** which are fastened together by suitable fasteners (not shown). If desired, the housing can be fabricated from a thermoplastic material. A suction motor **110** and fan **112** are mounted within the housing **10**. A cap **114** is mounted in the housing halves to secure the motor and fan in place. A filter assembly is mounted adjacent the suction fan and motor. The filter assembly comprises a first frame member **120**, a filter **122,** a second frame member **123** and a cap **124.** The filter serves to filter air before it is drawn into the motor **110** by the fan **112.**

[0031] Outlet slots **126** are provided on the first and second housing halves **100** and **102** for allowing an exhaust of air from the housing and for providing ventilation and cooling of the suction motor **110.** A switch **130,** which protrudes through opening **132** of the second housing half **102,** is provided for selectively powering the motor **110** as well as the motor **70 (FIGURE 5).** The housing **10** further comprises a handle strap **140** which is mounted to a top surface of the housing.

[0032] Cooperating openings **142** (only one of which is visible) in the housing halves **100, 102** allow air from the dirt container to be pulled in by the suction fan **112** through the filter **122.** Cooperating rear portions **146** (only one of which is visible) of the housing halves **100, 102** mount a sheath **152** in which is slidably received a cleaning attachment or crevice tool **150.** The sheath also forms an inlet mount **154** for the power cord **26 (FIGURE 1)** of the vacuum cleaner. Suitable wiring (not shown) connects the power cord **26** to the motor **110** and to a sleeve **160** in which the electrified hose is mounted. End **22** of the electrified hose **20** is pulled out of the suction nozzle **16** and is slidably mounted in an inlet end **148** of the cleaning attachment **150** for above-floor cleaning.

[0033] The sleeve **160** is mounted on the first housing half **100.** The sleeve has an opening **162** for receiving one end of the electrified hose **20.** The sleeve **160** protects the electrical connections of the hose **20** and connects the hose to the motor **70** in the suction nozzle **16.**

[0034] Referring now to **FIG. 7,** the dirt container **18** comprises a first container portion **180** and a second container portion **182** which are fastened together by suitable fasteners **184** to form a dirt and dust collecting chamber. If desired, the dirt container can be fabricated from a transparent thermoplastic material to enable the user to see the dirt and debris being collected in the dirt container.

[0035] As shown in **FIGURE 8,** filter frame **190** and filter **192** form a filter assembly releasably positioned in the dirt container **18** to form a wall and outlet of the dirt container. The filter **192** is removable from the filter frame **190** for replacing the filter. The filter assembly is removed from the dirt container to allow emptying of dirt and debris collected within the dirt container. The outlet formed by the filter is adjacent to and in fluid communication with the suction fan and motor assembly **110, 112** within housing **10.**

[0036] A ring **194** is mounted above an opening **196** in the first container portion to form an inlet which is in fluid communication with the electrified hose **20.** A latch **198** is mounted with a clip **200** to the cooperating container portions **180, 182** to detachably secure the dirt container to a catch (not shown) on the housing second end **14.**

[0037] The hand-held vacuum cleaner operates as follows. The electrified hose **20** is threaded or slidably connected at a first end **22** to the suction nozzle **16** and at a second end **24** to the housing **10.** The suction nozzle **16** may be used attached to the housing (see **FIG. 1**) or in a detached position (see **FIG. 2**). The suction nozzle **16** would be used in a detached position to facilitate easier cleaning of stairs, room corners, crevices in sofas and chairs, etc.

[0038] The dirt container **18** is secured to the housing through the latch **198** which engages a catch (not shown) on the housing second end **14.** The switch **130** is depressed to an 'on" position, thus powering the suction fan **112** and motor **110** assembly. The switch **130** also provides power to the hose **20,** thus electrifying the hose. The hose **20** in turn provides power to the motor **70** within the suction nozzle **16.** The motor **70** causes the brushroll **50** to rotate through the use of the toothed belt **58.** The brushroll **50** loosens dirt and debris on the surface being cleaned, enabling easier suctioning of the dirt from the surface.

[0039] The suction fan **112** and motor **110** produce an airflow which travels through the suction nozzle opening **40** into the hose **20** and then into opening **196** of the dirt container. As the dirt and airflow are drawn into the dirt container chamber, dirt is deposited in the dirt container upstream of the filter **192.** The filter **192** and its frame **190** prevent the dirt and debris from entering the suction fan and motor assembly.

[0040] Air is exhausted from the housing **10** through air outlets **126,** serving at the same time to cool the motor **110** and prevent it from overheating.

[0041] Once the cleaning of the surface is completed, the switch **130** is turned to the "off" position. Then, the

dirt container **18** can be removed from the housing by depressing the latch **198.** The filter **192** and filter frame **190** are removed from the dirt container thus allowing the dirt container to be emptied of dirt and debris.

Claims

1. A hand-held vacuum cleaner comprising:

   a housing (10) having a first end (12) and a second end (14);
   a suction fan (112) and a first motor (110) assembly located in said housing (10);
   a dirt container (18) detachably mounted on said housing second end (14); and
   a suction nozzle (16) selectively mounted adjacent said housing first end (12) and usable both in an attached position and in a detached position for cleaning.

2. The hand-held vacuum cleaner of claim 1 further comprising a brushroll (50) housed within said suction nozzle (16).

3. The hand-held vacuum cleaner of claim 1 or 2 further comprising an electrified hose (20) connected at a first end to said suction nozzle (16) and at a second end to said housing adjacent said second end.

4. The hand-held vacuum cleaner of any of the claims 1 to 3 further comprising a second motor (70) within said suction nozzle (16), wherein said second motor (70) is operatively connected to said electrified hose (20) and to said brushroll (50) for powering said brushroll.

5. The hand-held vacuum cleaner of any of the claims 1 to 4 further comprising at least one air outlet in a wall of said housing for allowing an exhaust of air from said housing.

6. The hand-held vacuum cleaner of any of the claims 1 to 5 wherein said dirt container defines a dirt and dust collecting chamber, said dirt container comprising:

   an inlet being in fluid communication with said second end of said electrified hose (20), and an outlet being in fluid communication with said suction fan (112) and first motor (110) assembly.

7. The hand-held vacuum cleaner of any of the claims 1 to 6 further comprising a filter assembly releasably positioned to form said outlet of said dirt container (18), said filter assembly comprising a filter (122) and a filter frame (120, 123).

8. The hand-held vacuum cleaner of any of the claims 1 to 7 wherein said dirt container further comprises a latching mechanism for securing said dirt container to said housing second end.

9. The hand-held vacuum cleaner of any of the claims 1 to 8 wherein said housing further comprises a hollow section formed above said suction fan (112) and first motor (110) assembly, said hollow section receiving an above-floor cleaning attachment.

10. The hand-held vacuum cleaner of any of the claims 1 to 9 wherein said housing further comprises a handle secured to a top surface of said housing.

11. The hand-held vacuum cleaner of any of the claims 1 to 10 wherein said housing (10) is comprised of a first portion (100) and a second portion (102) which are secured to each other.

12. The hand-held vacuum cleaner of any of the claims 1 to 11 wherein said suction nozzle (16) comprises a handle (36).

13. A hand-held vacuum cleaner comprising:

   a housing (10) having a first end (12) and a second end (14);
   a suction source housed within said housing;
   a dirt container (18) detachably mounted on said housing adjacent said second end; and
   a suction nozzle (16) selectively mounted adjacent said housing first end, said suction nozzle comprising a brushroll (50) and a motor (70) housed within said suction nozzle (16).

14. The hand-held vacuum cleaner of claim 13 further comprising an electrified hose (20) connected at a first end to said motor (70) housed within said suction nozzle (16) and at a second end to said suction source.

15. The hand-held vacuum cleaner of claim 13 or 14 further comprising at least one air outlet in a wall of said housing for allowing an exhaust of air from said housing.

16. The hand-held vacuum cleaner of any of the claims 13 to 15 wherein said dirt container (18) defines a dirt and dust collecting chamber, said dirt container comprising:

   an inlet in fluid communication with said second end of said electrified hose (20), and an outlet in fluid communication with said suction source.

17. The hand-held vacuum cleaner of any of the claims 13 to 16 further comprising a filter assembly releasably positioned adjacent said outlet of said dirt container, said filter (122) assembly comprising a filter and a filter frame (120, 123).

18. The hand-held vacuum cleaner of any of the claims 13 to 17 wherein said dirt container (18) further comprises a latching mechanism for securing said dirt container to said housing second end.

19. The hand-held vacuum cleaner of any of the claims 13 to 18 wherein said suction nozzle comprises a handle (36).

20. A hand-held vacuum cleaner comprising:

a housing (10) having a first end and a second end (14); a dirt container (18) detachably mounted on said housing adjacent said second end thereof;
a suction nozzle (16) selectively mounted adjacent said housing first end; and
a hose (20) connected at a first end to said suction nozzle and at a second end to said housing.

21. The hand-held vacuum cleaner of claim 20 wherein said hose (20) is slidably mounted at said hose first end to said suction nozzle (16) and at said hose second end to said housing.

22. The hand-held vacuum cleaner of claim 20 or 21 further comprising a suction fan (112) and a first motor (110) assembly located in said housing.

23. The hand-held vacuum cleaner of any of the claims 20 to 22 further comprising a brushroll (50) rotatably mounted in said suction nozzle (16).

24. The hand-held vacuum cleaner of any of the claims 20 to 23 further comprising a second motor (70) mounted in said suction nozzle (16), wherein said second motor (70) is operatively connected to said brushroll (50) for powering said brushroll.

25. The hand-held vacuum cleaner of any of the claims 20 to 24 further comprising at least one air outlet in a wall of said housing for allowing an exhaust of air from said housing.

26. The hand-held vacuum cleaner of any of the claims 20 to 25 wherein said dirt container (18) defines a dirt and dust collecting chamber, said dirt container comprising:

an inlet in fluid communication with said second end of said electrified hose, and an outlet in fluid communication with said suction fan and said first motor (110) assembly.

27. The hand-held vacuum cleaner of any of the claims 20 to 26 further comprising a filter assembly releasably positioned adjacent said outlet of said dirt container, said filter (122) assembly comprising a filter and a filter frame (120, 123).

28. The hand-held vacuum cleaner of any of the claims 20 to 27 wherein said suction nozzle (16) comprises a handle (36).

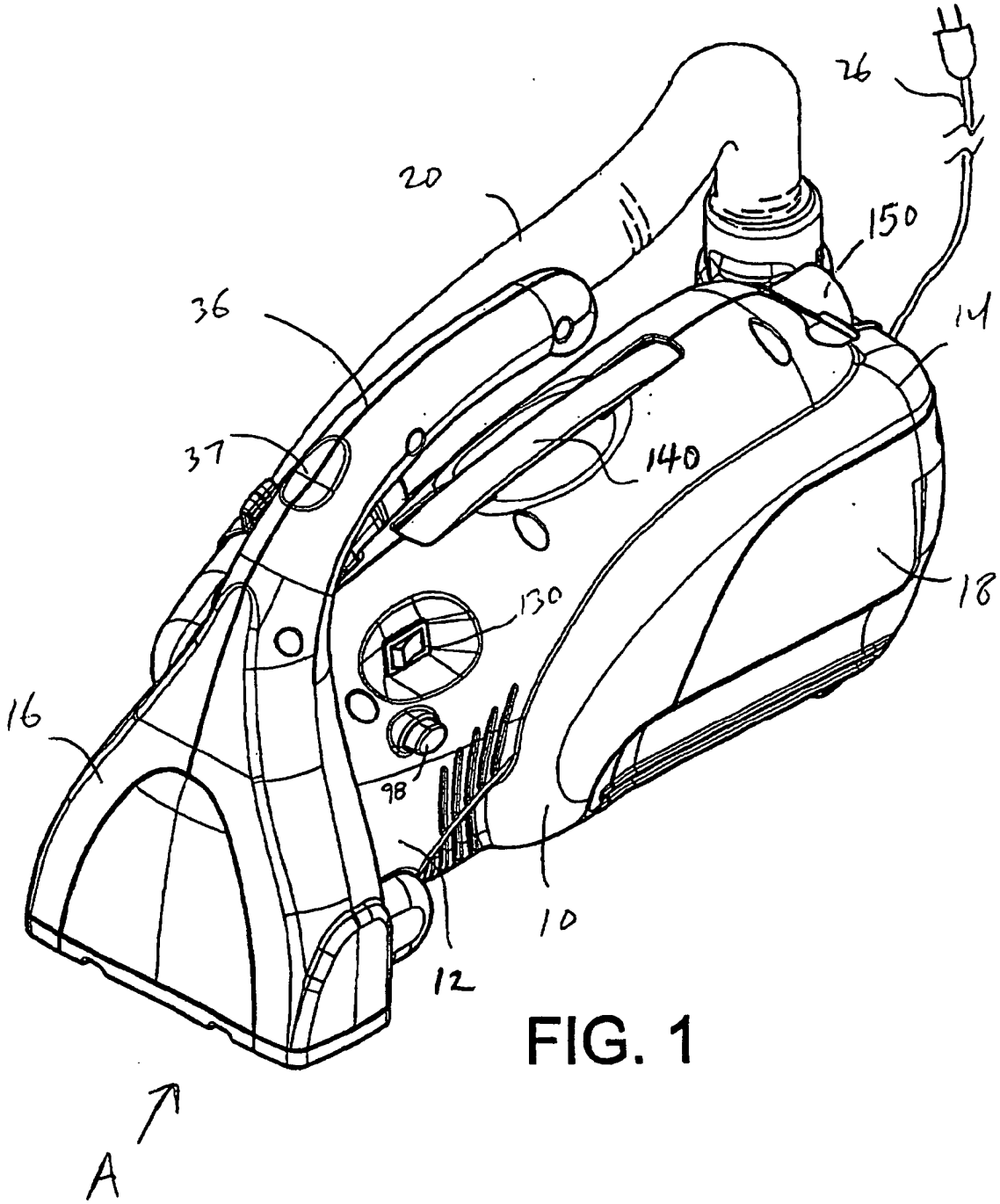


FIG. 1

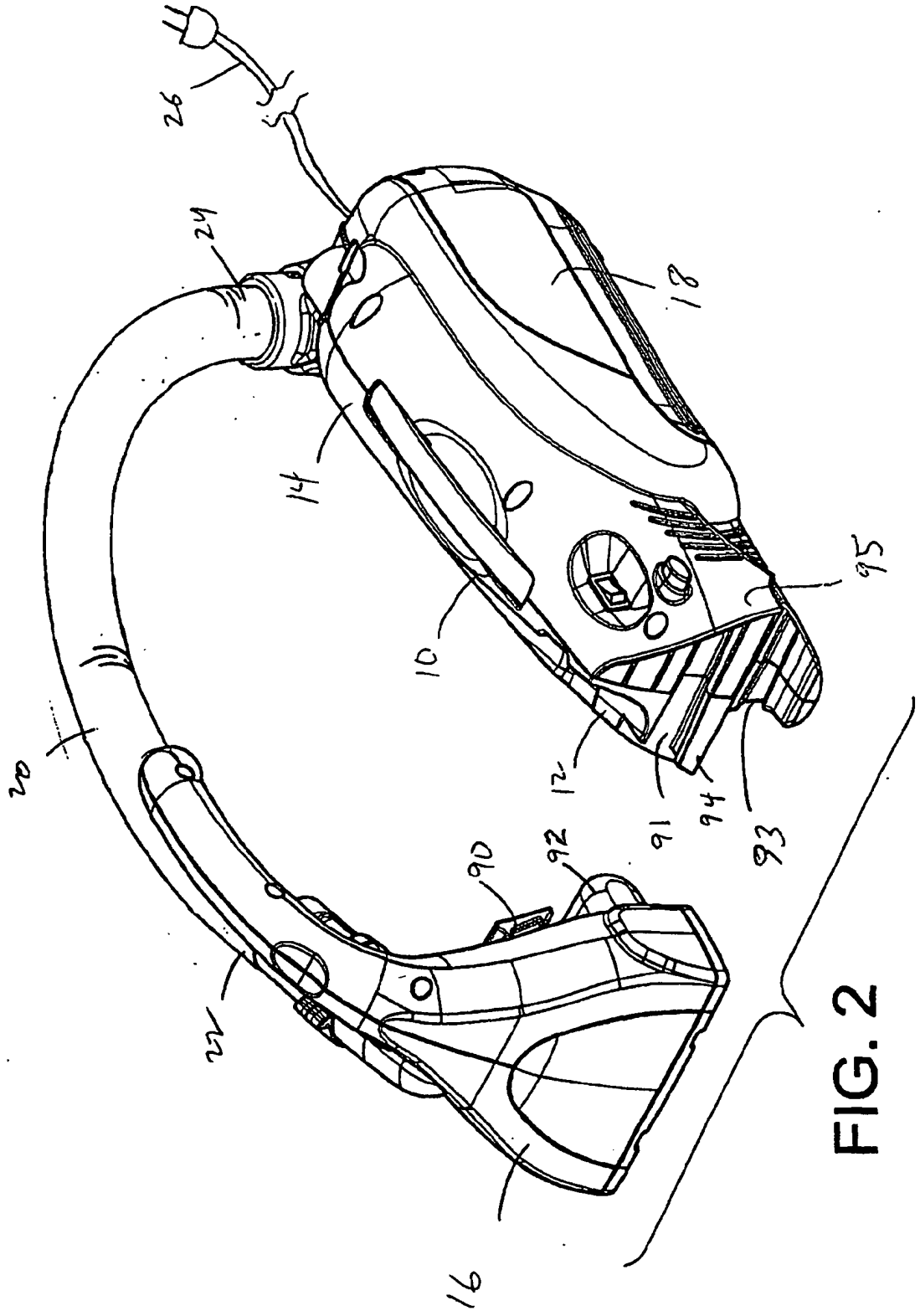


FIG. 2

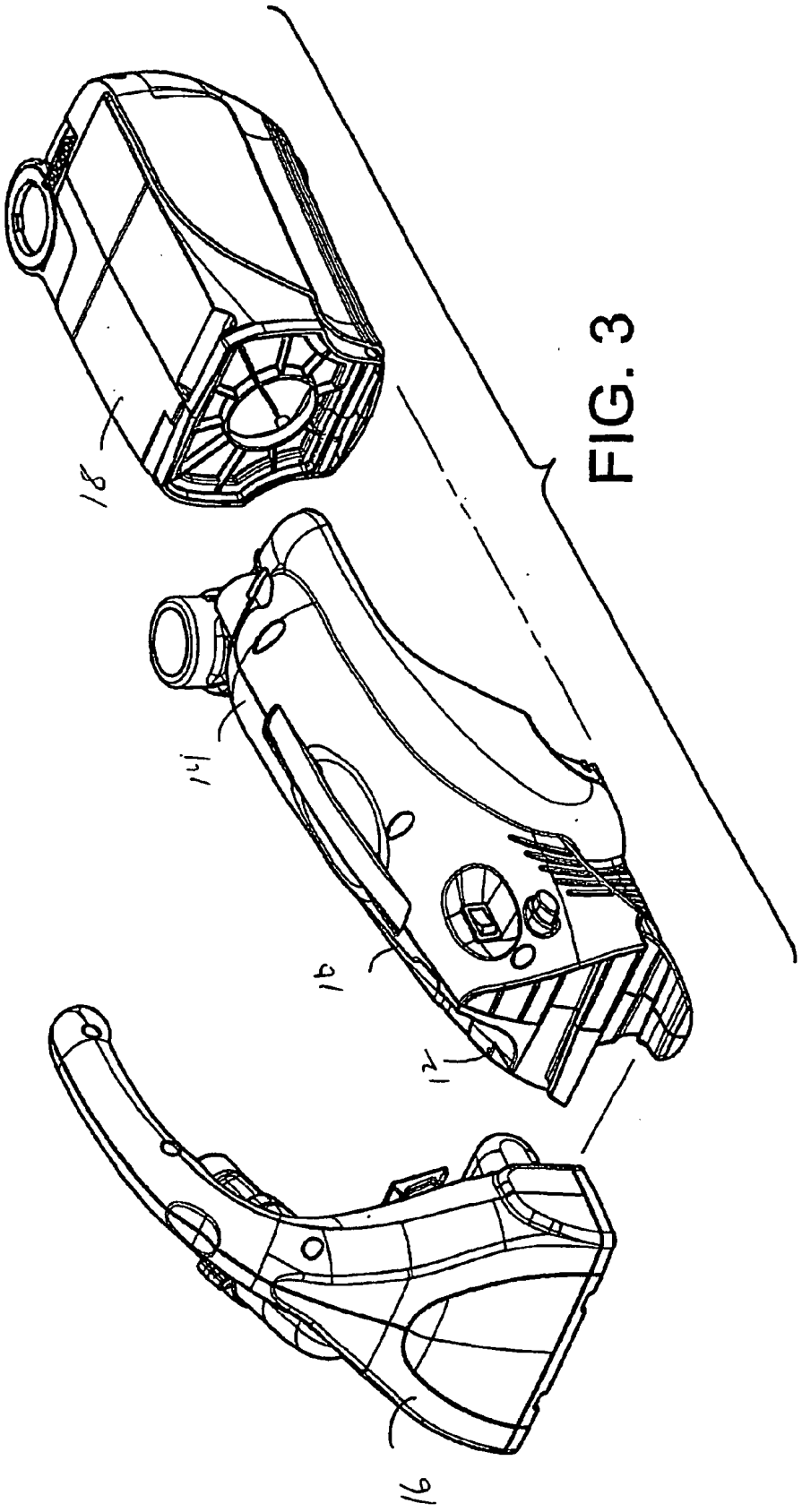


FIG. 3

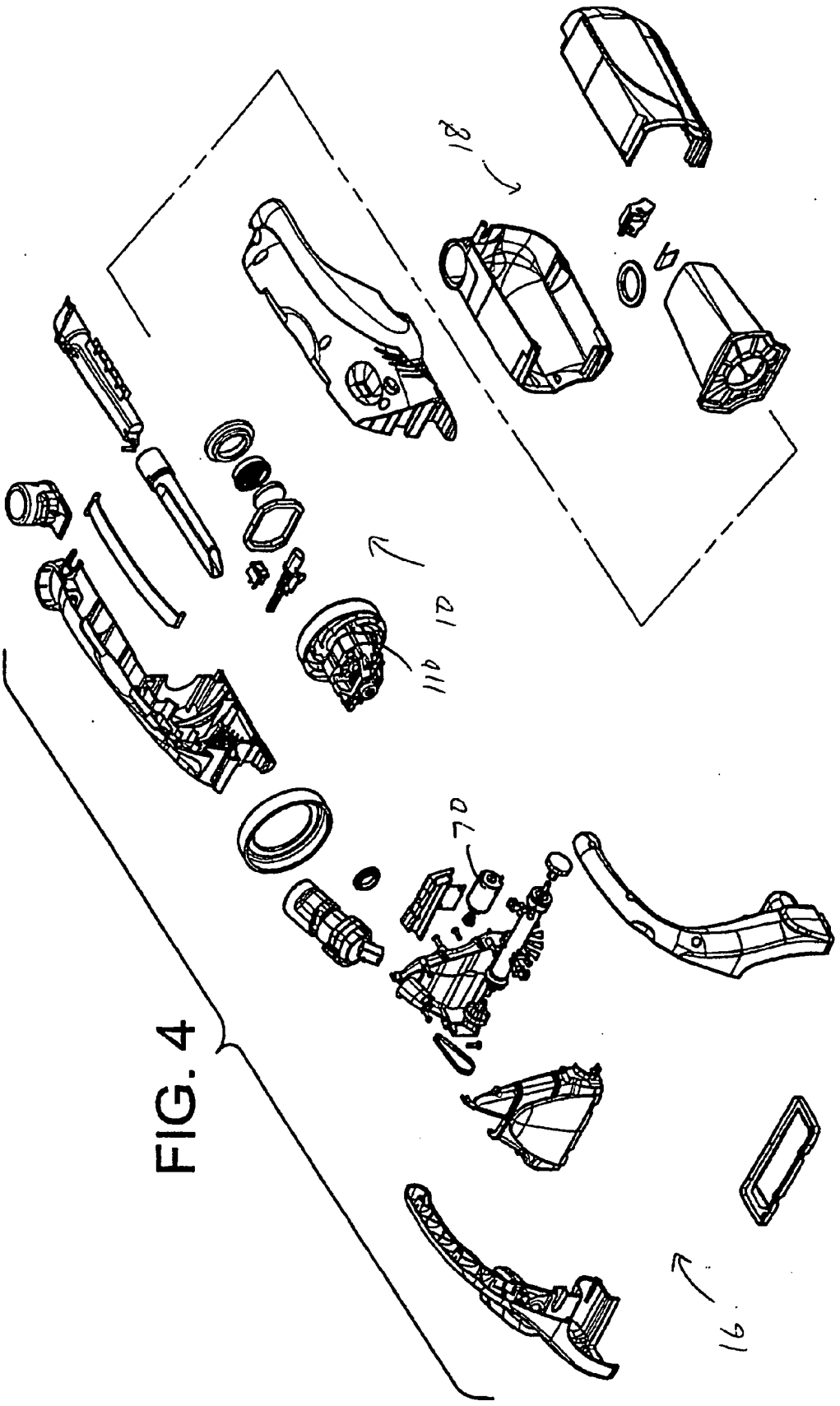


FIG. 4

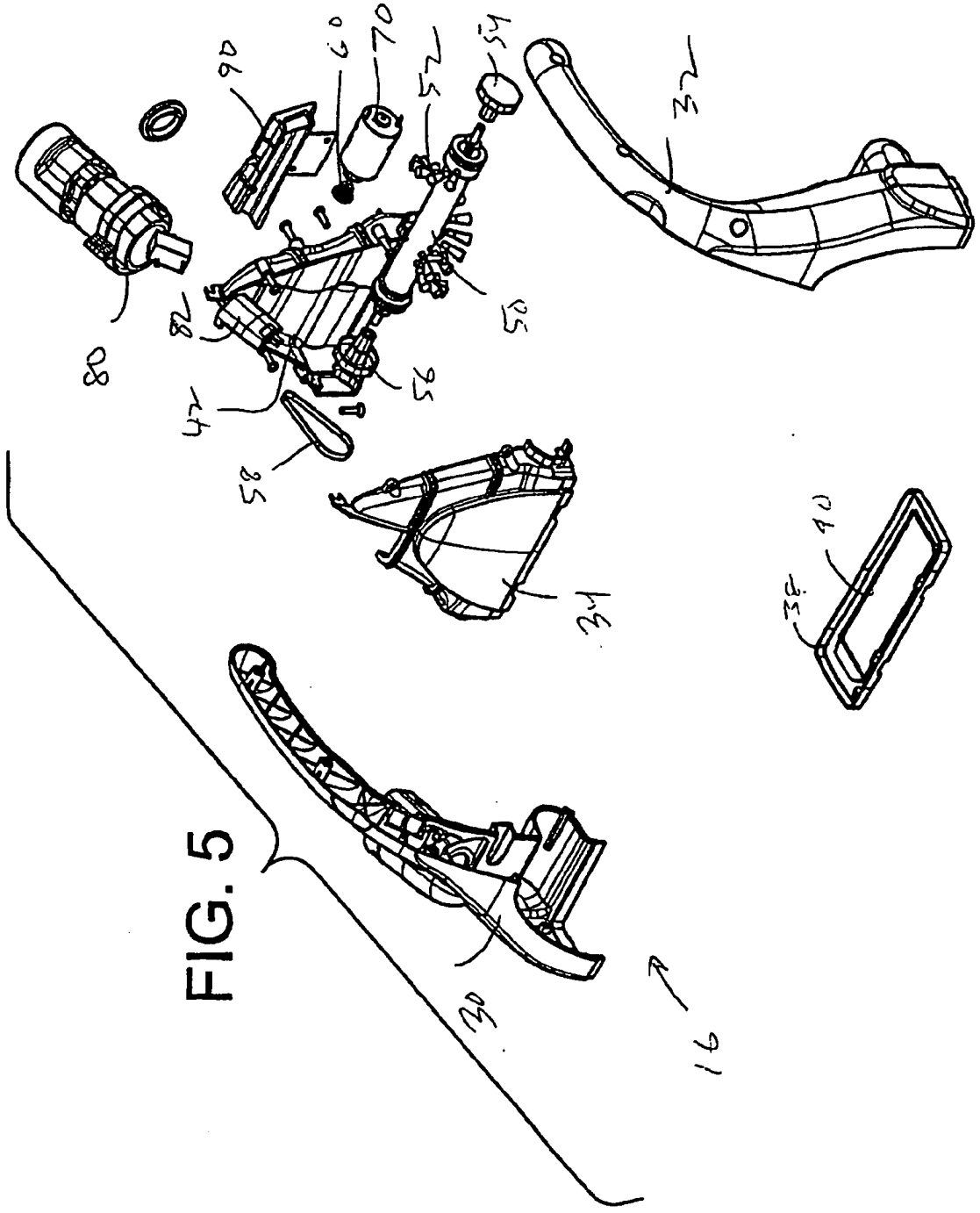
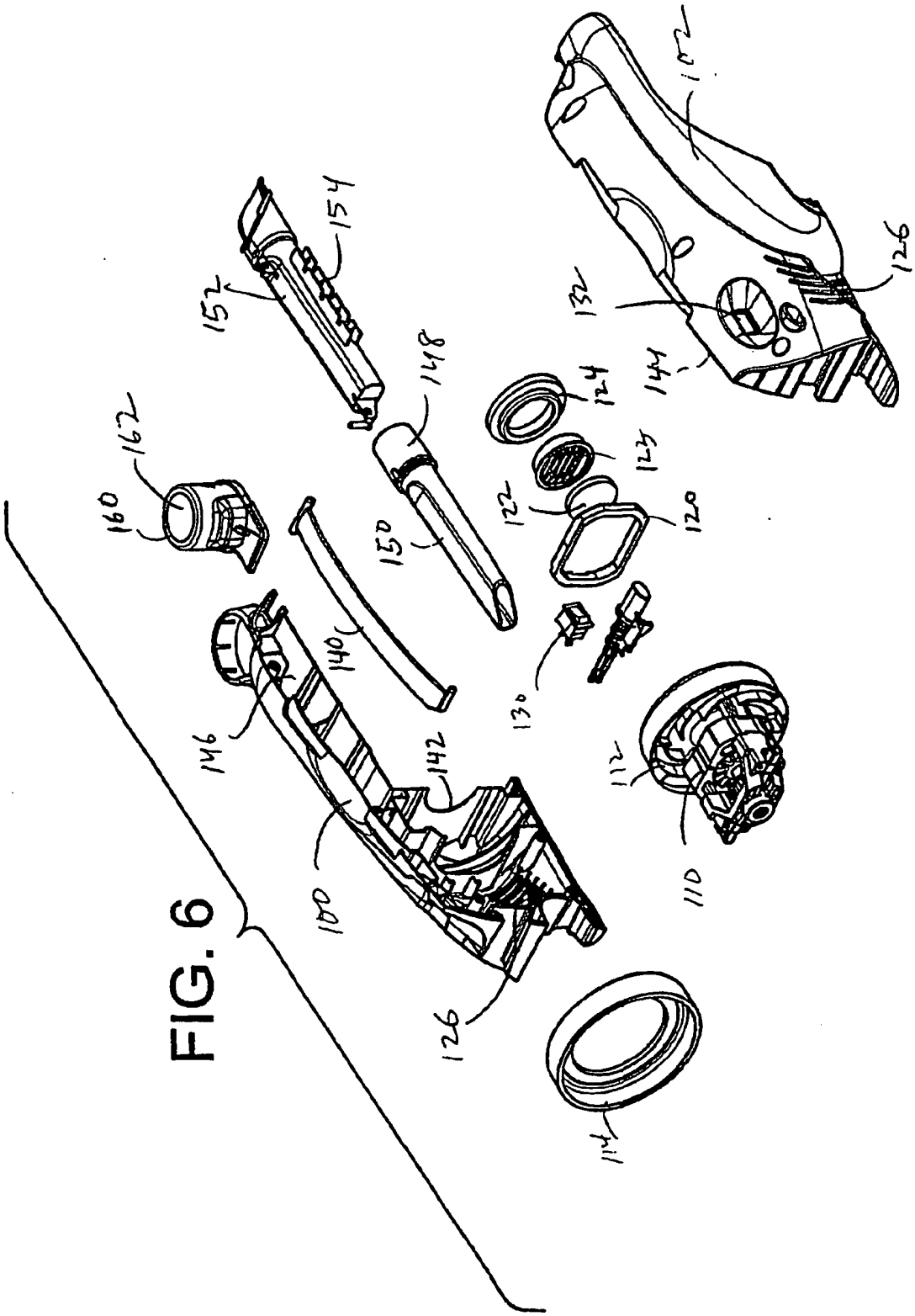


FIG. 5


154
152
148
162
160
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124
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132
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126
141
146
142
130
112
110
100
126
114

FIG. 6

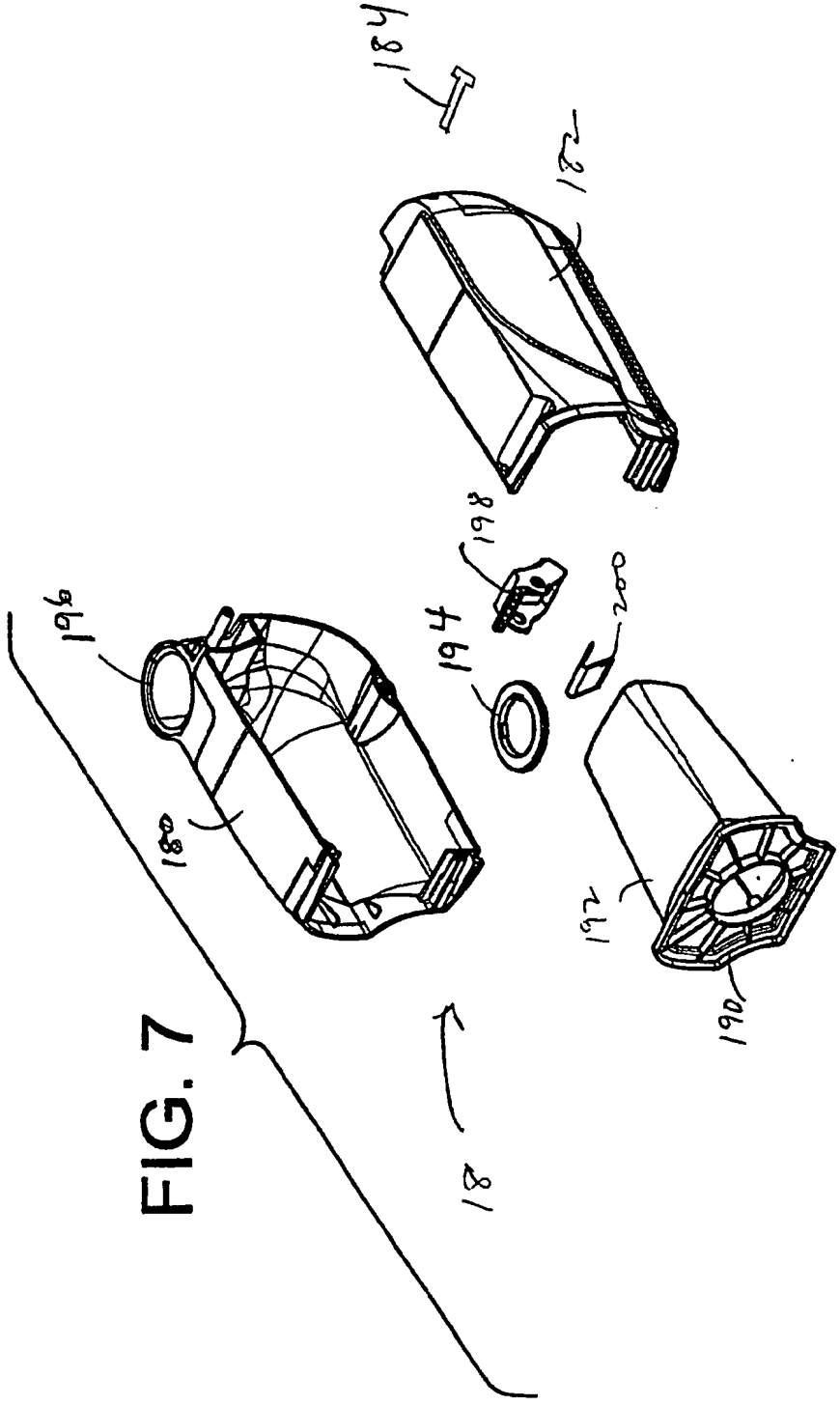

FIG. 7

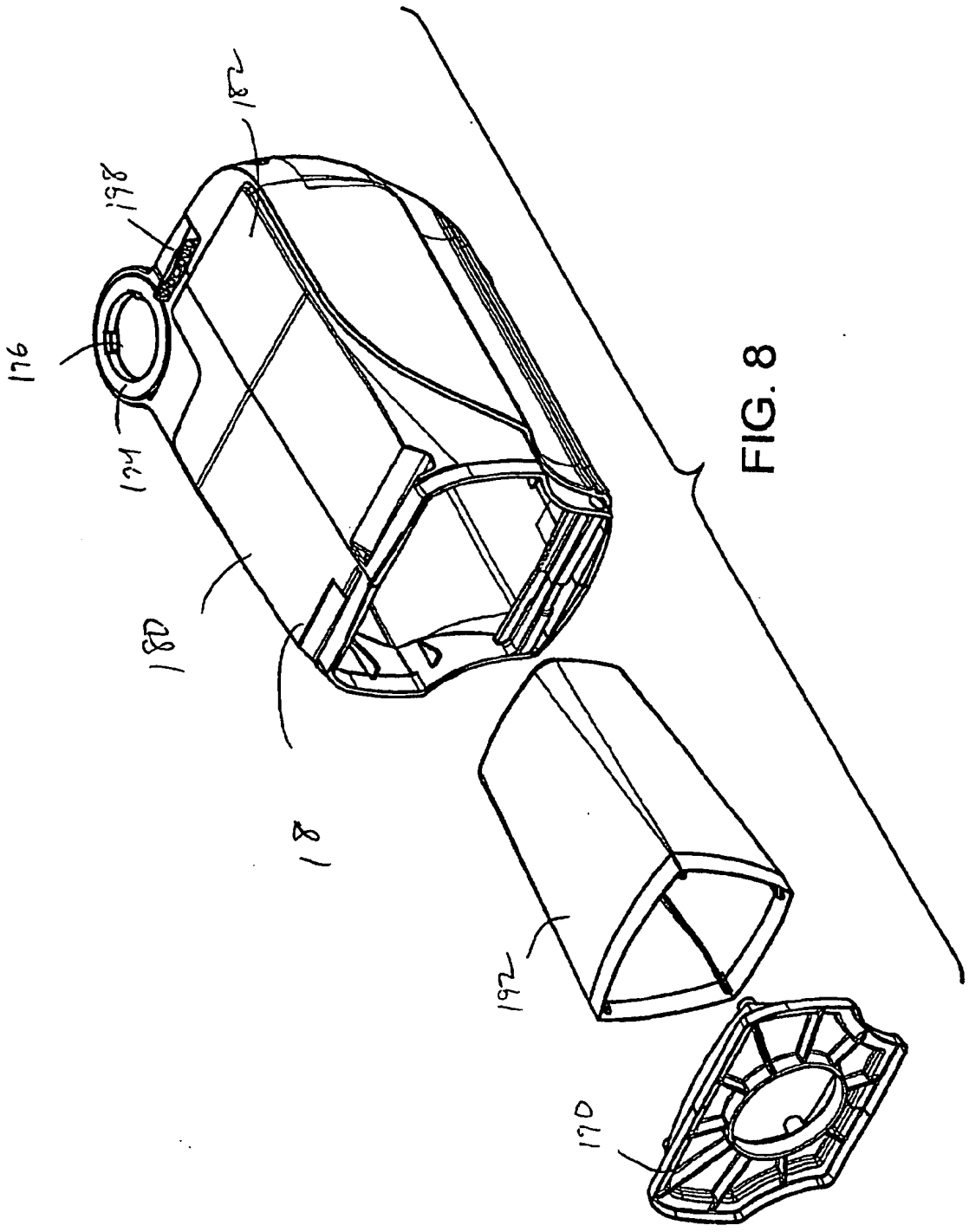

FIG. 8

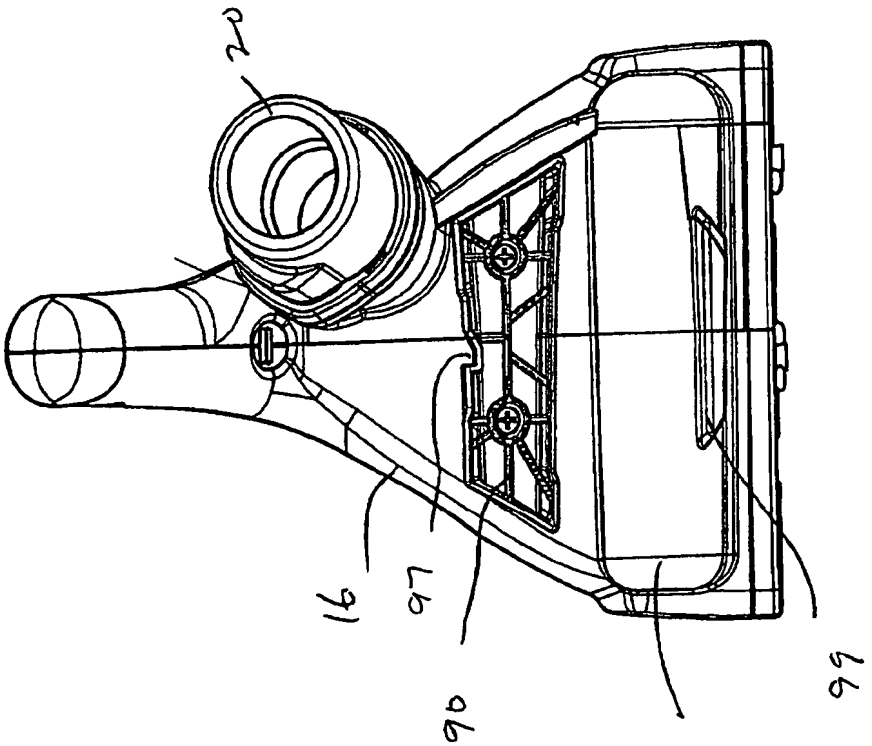

FIG. 9B

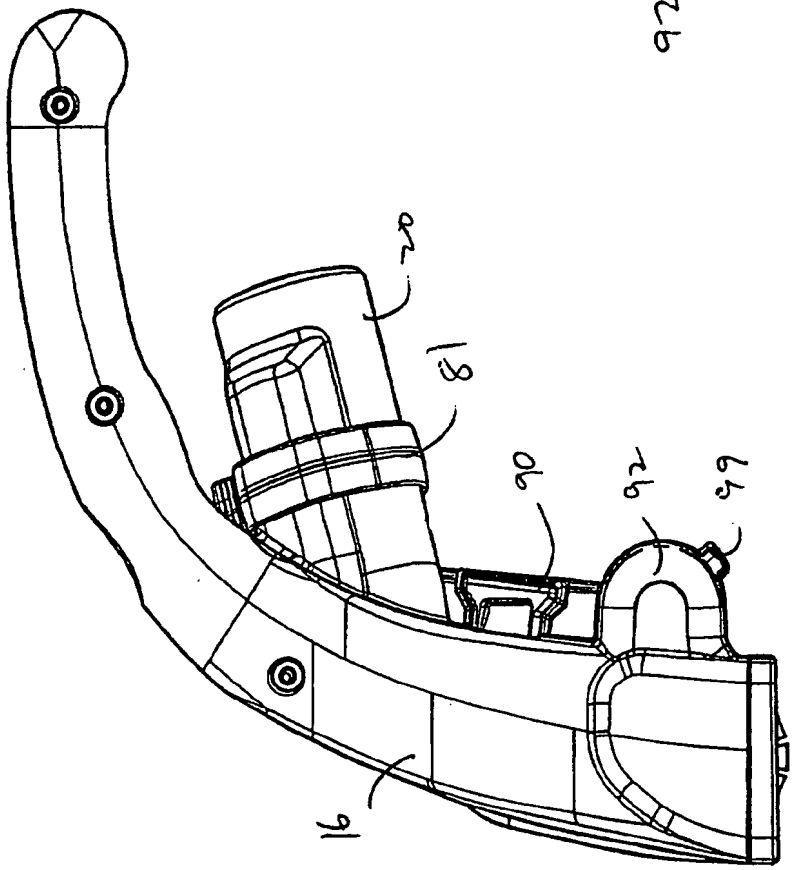

FIG. 9A

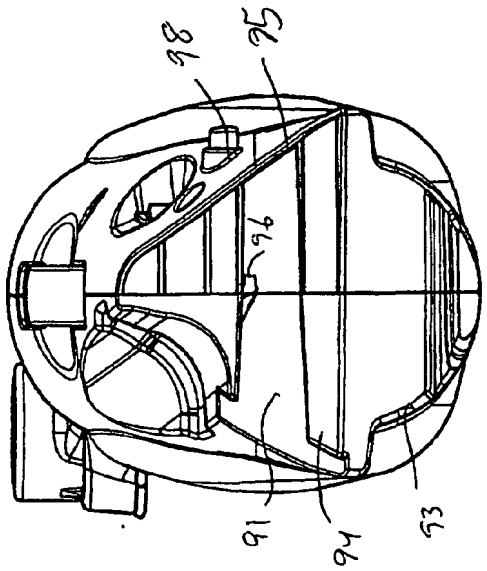

FIG. 10B

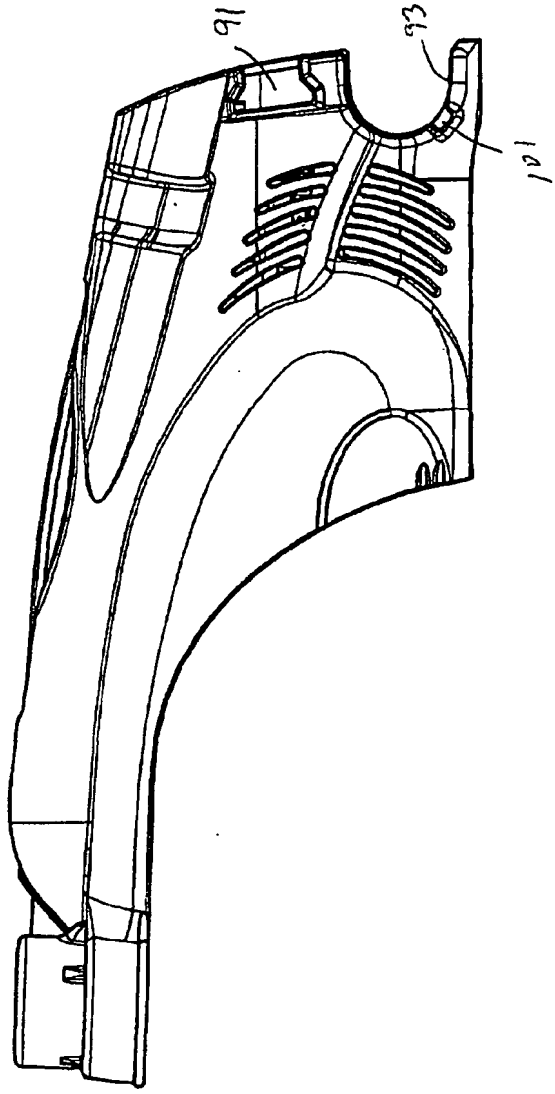

FIG. 10A